

From Brine to Beautiful

The City of Goodyear - “One-Water” Approach for Inland Brine Disposal

Governor’s Water Augmentation Council
Desalination Committee

May 15, 2017



**PROTECTING
ARIZONA'S WATER SUPPLIES**
for ITS NEXT CENTURY

Partners



Background

Largest R/O facility in the State of Arizona for drinking water supplies

- 4.5 MGD treatment capacity



R/O Process generates 0.8 MGD of brine concentrate

- Currently discharged to the City's WRF – chemically impacting this facility

Background

Brine Concentrate has several constituents of concern:

- 8,000 mg/L TDS
- High concentrations of
 - ❖ Selenium
 - ❖ Fluoride
 - ❖ Arsenic
 - ❖ Nitrate



Background

Currently sent to the City's water reclamation facility:

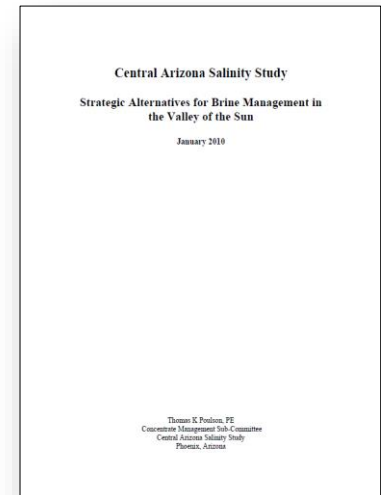
- Chemically impacting that facility
- Taking up valuable capacity



Inland Brine Disposal Dilemma

Alternative Comparison 10 mgd (millions of dollars)

10 MGD	Pipeline to Yuma	Evaporation Pond	Brine Concentrator	Soften/ RO/ VSEP	Wetlands Surface Discharge	Injection Well
Capital	\$266.11	\$651.69	\$272.71	\$286.56	\$150.22	\$ 114.46
O&M	\$ 0.62	\$ 3.50	\$ 29.75	\$ 6.90	\$ 1.75	\$ 11.31
Annualized	\$ 14.92	\$ 40.26	\$ 44.40	\$ 22.30	\$ 10.37	\$ 17.46



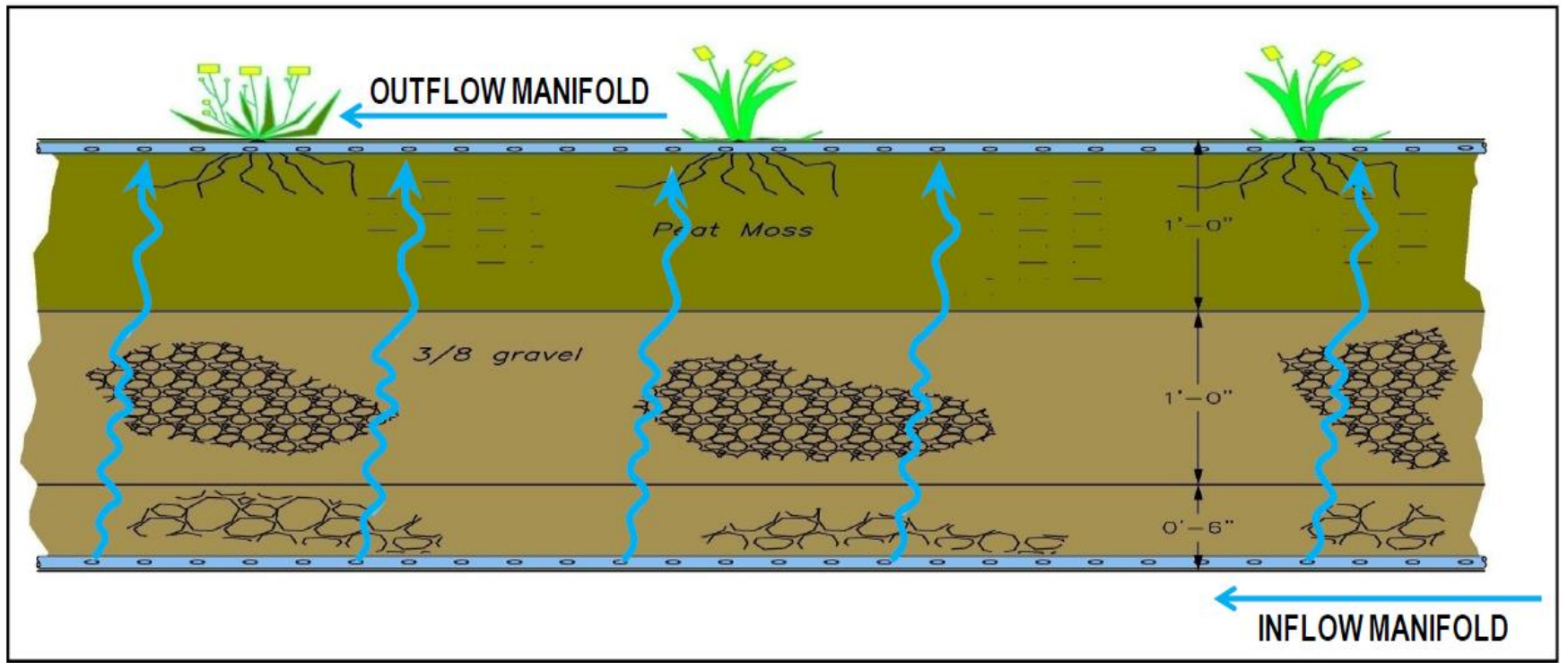
Goodyear Proceeded with Wetland Disposal

Developed a partnership with the United States Bureau of Reclamation to accomplish:

1. Develop brine wetland concept
2. Design brine wetland pilot
3. Construct Pilot – Determine proof of concept
4. Feasibility–30% design for a demonstration project
5. Construct demonstration project

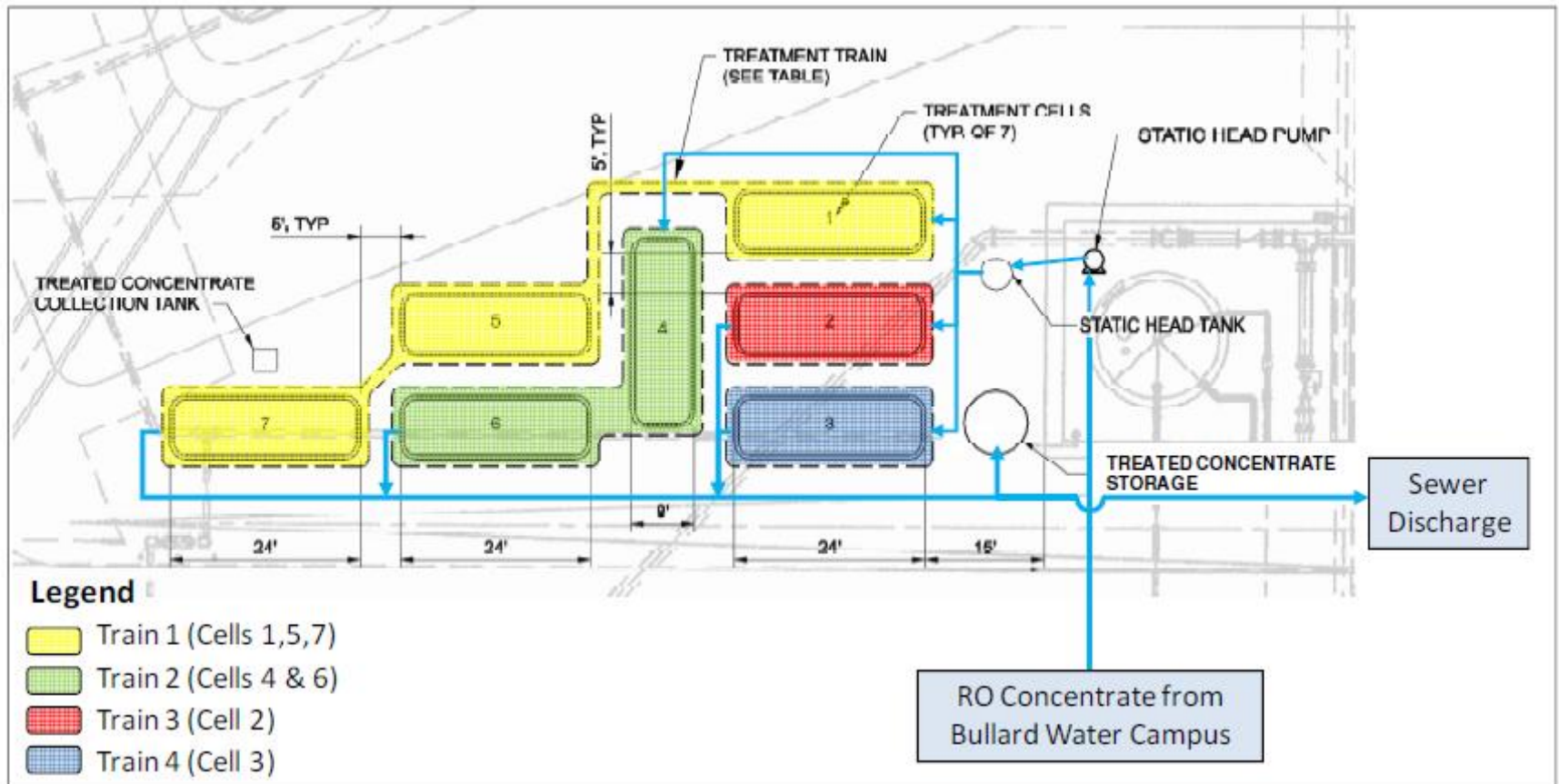


Wetland Design Concept



2010 Pilot Wetland Design

FIGURE 2
Treatment Trains Plan View



Bin 4 Wetland Planting

December 2010



November 2011



Bin 6 Wetland Planting



2010 – Pilot Wetland Project Construction

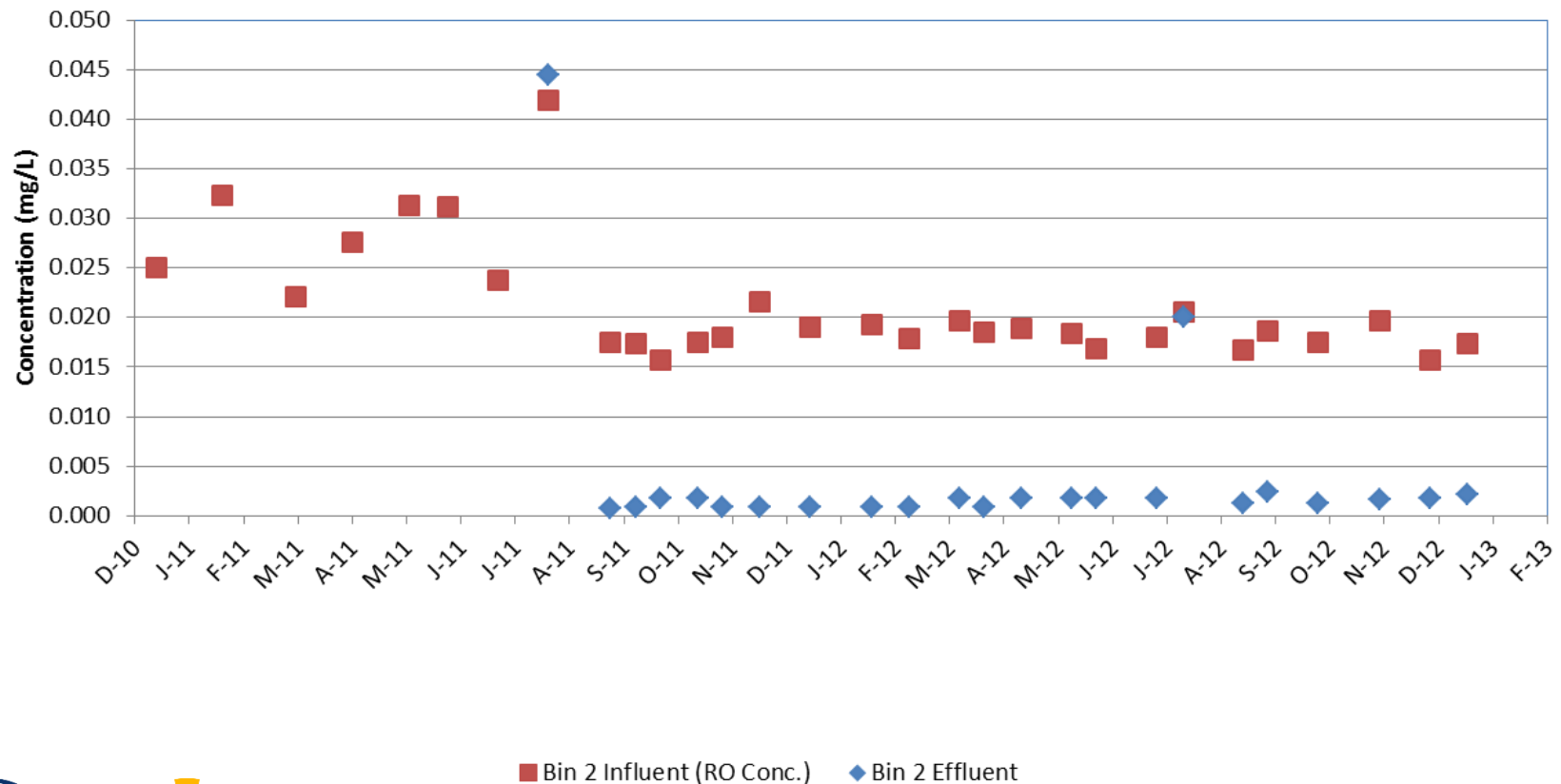
Determine proof of concept that contaminants could be treated through an engineered wetland

- Wetlands were evaluated for removal
 - ❖ Selenium
 - ❖ Arsenic
 - ❖ Nitrate
- Total dissolved solids



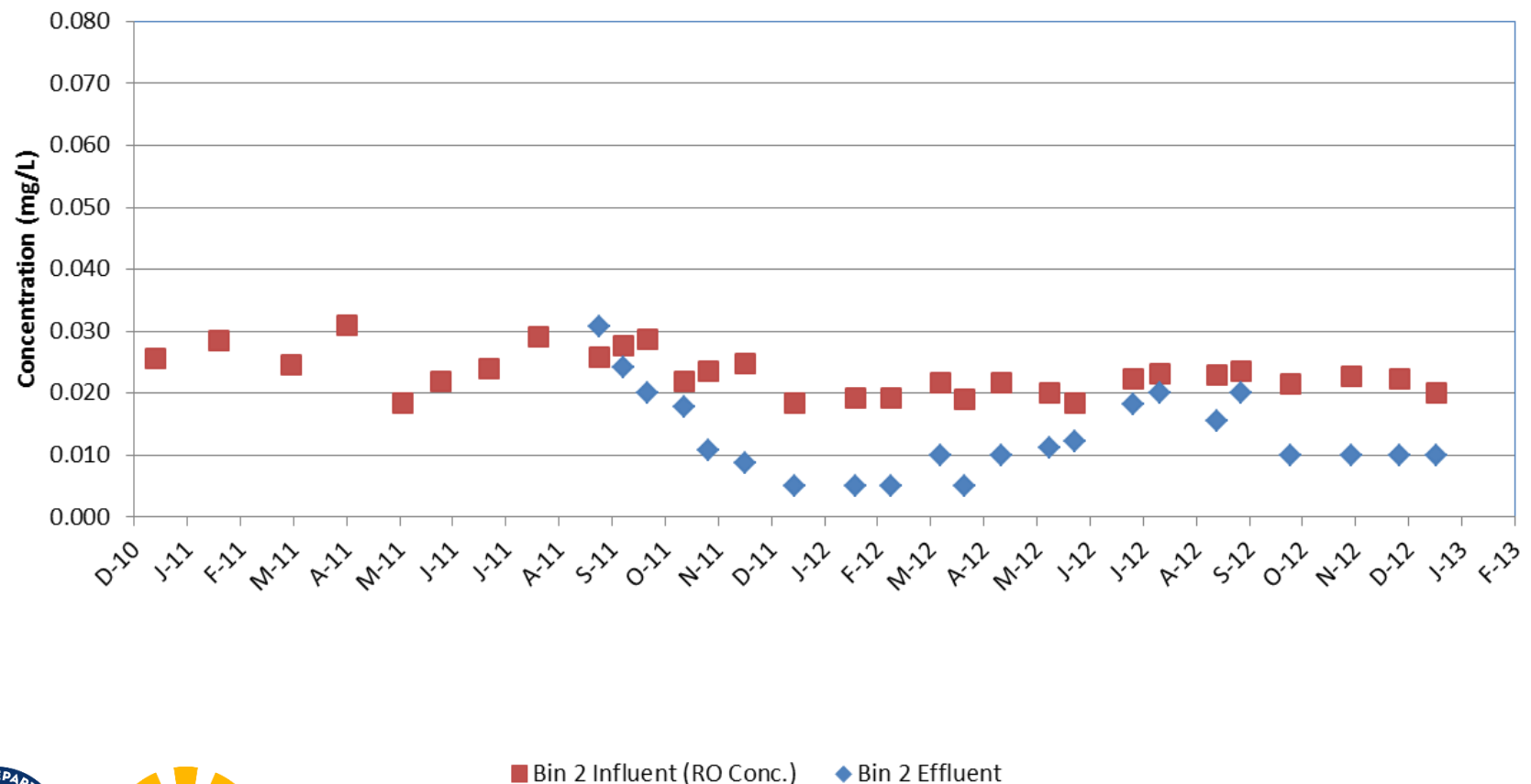
2010 – Pilot Wetland Project

Selenium - Total

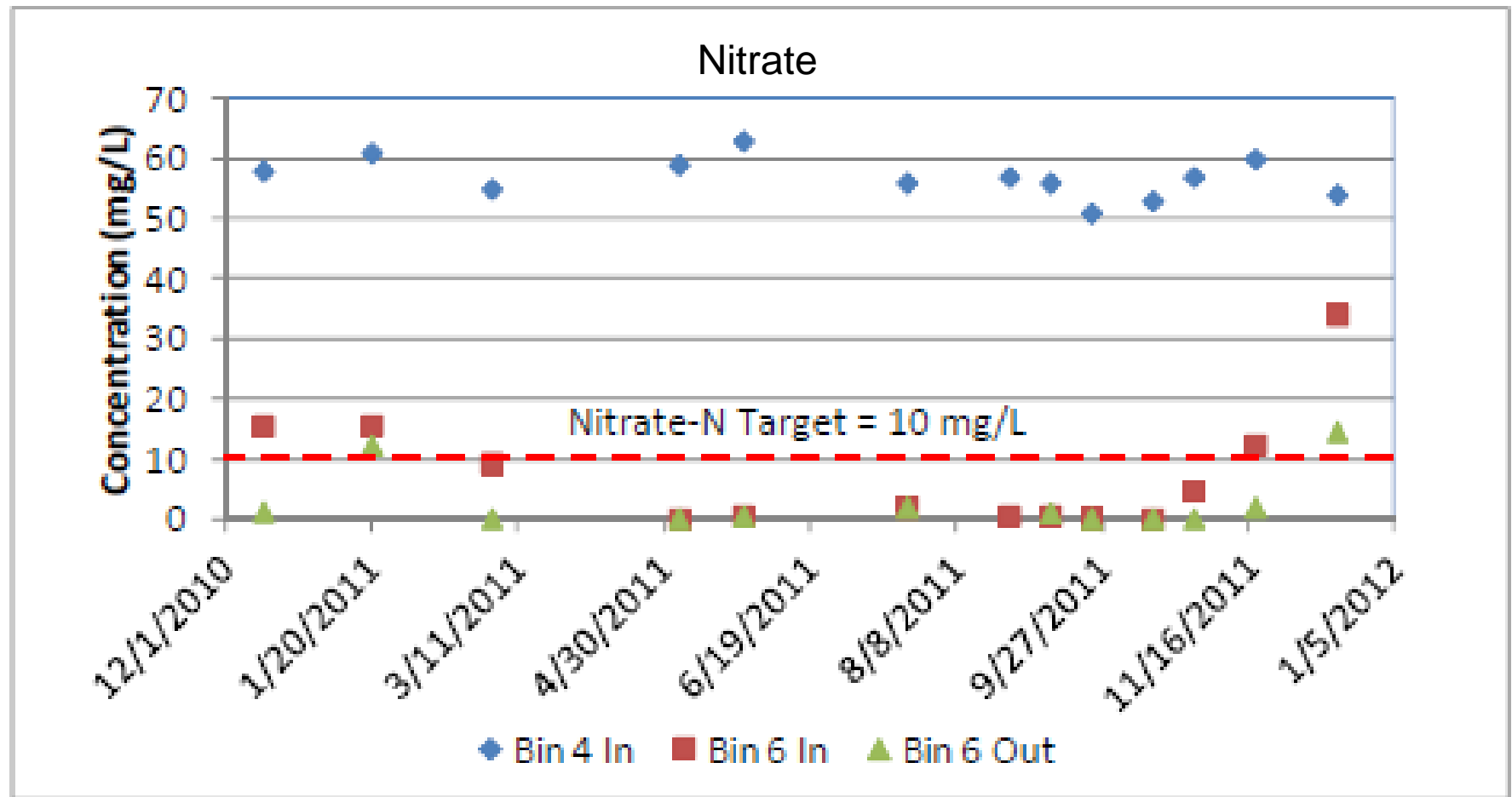


2010 – Pilot Wetland Project

Arsenic - Total



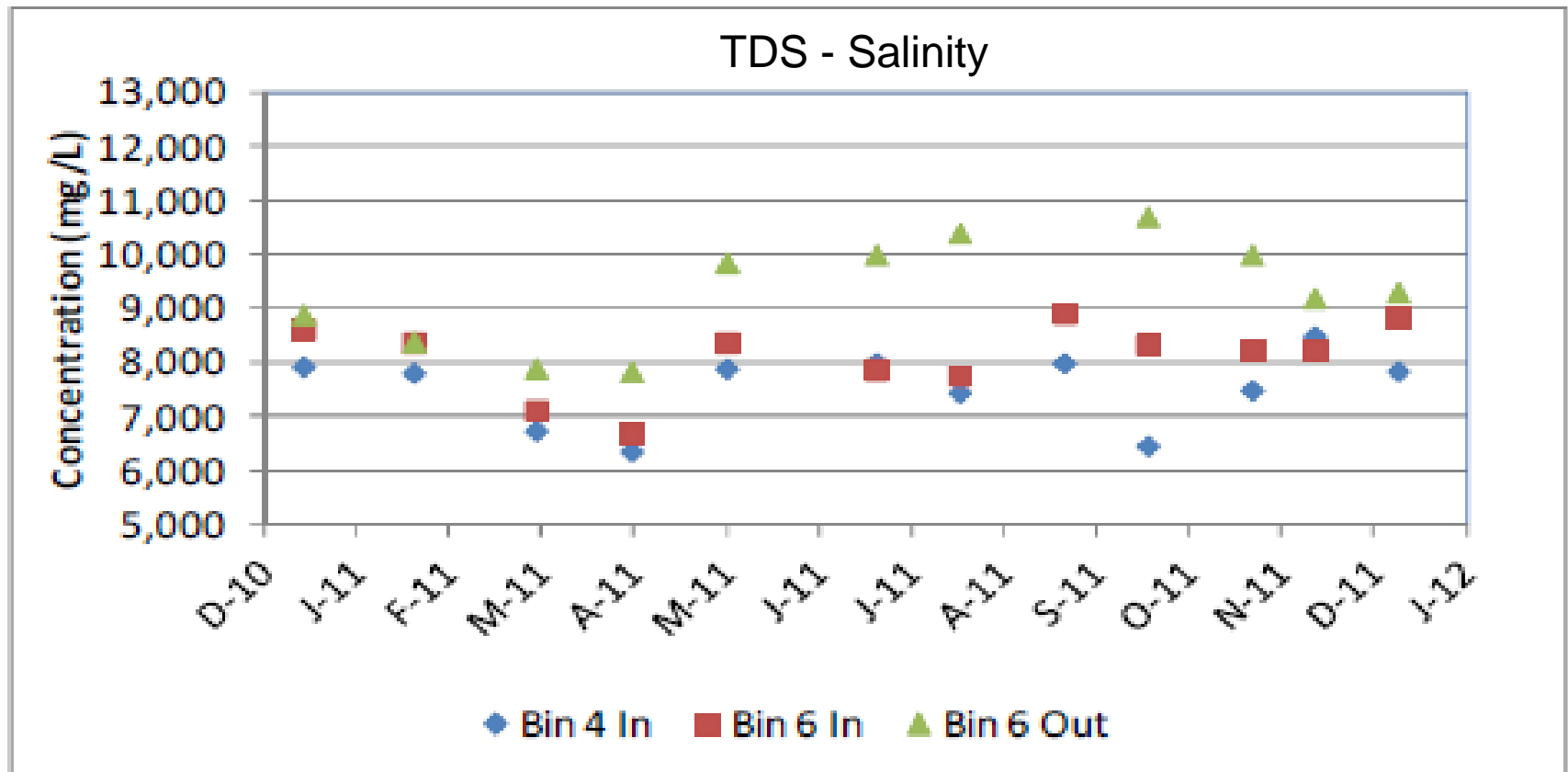
2010 – Pilot Wetland Project



2010 – Pilot Wetland Project

FIGURE 14

TDS Concentrations in Train 2



2010 – Pilot Wetland Project

Conclusions

- Proof of concept for the City's brine
 - ❖ Wetlands can successfully treat contaminants of concern in brine
 - ❖ Salinity increases at wetland discharge point
 - water blending strategy needed if water is discharged to waters of the US.



Goodyear Proceeded with Wetland Disposal

Developed a partnership with the United States Bureau of Reclamation to accomplish:

1. Develop brine wetland concept ✓
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3. Construct Pilot – Determine proof of concept ✓
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Feasibility Work

- Invited all potential stakeholders to participate
- Feasibility Work – Two parts:
 1. Complete a wetland siting analysis
 2. Complete a 30% Design Concept Report (DCR)



Using One Water



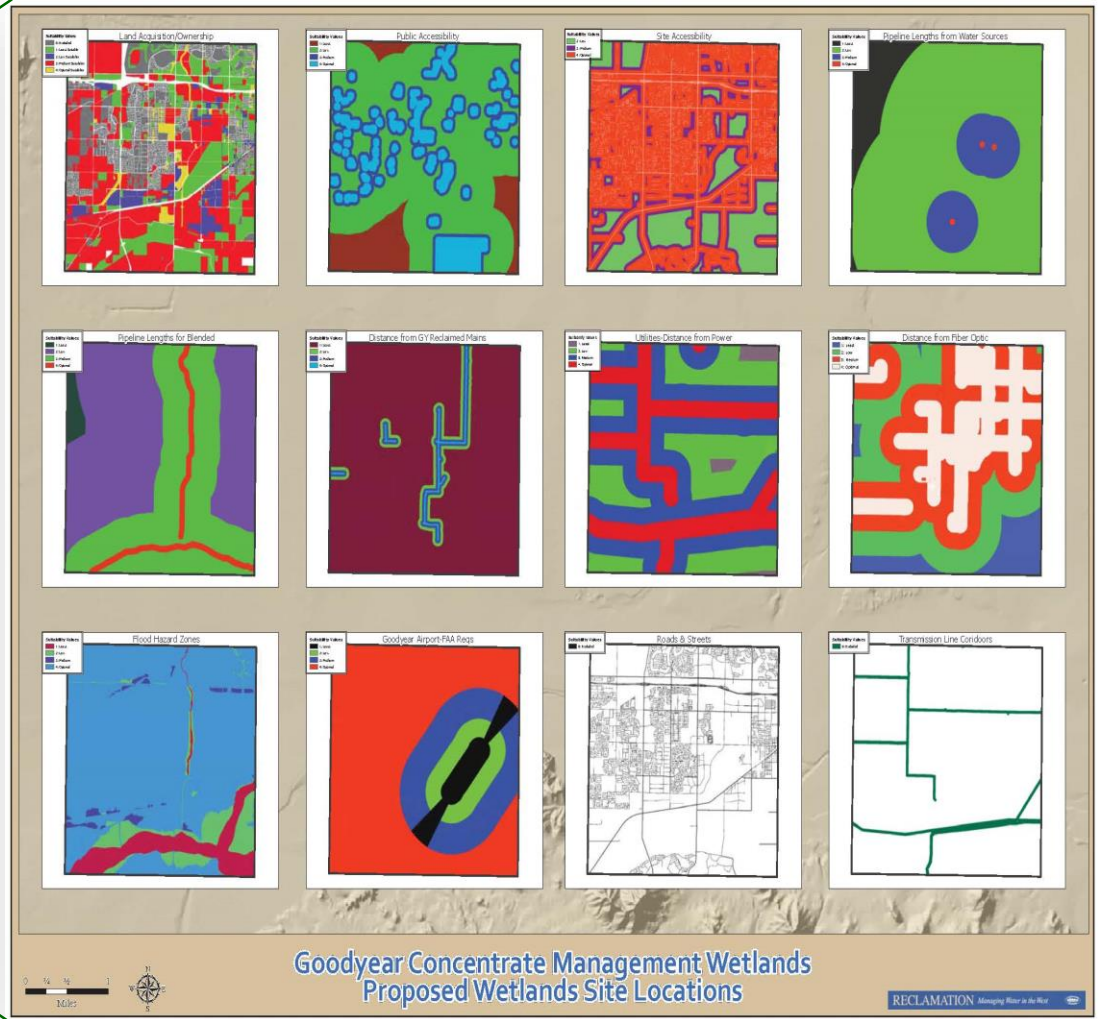
Siting Analysis

- FAA Restrictions
- Gravity, distance, and Operations & Maintenance
- Existing recreational facilities
- Proximity to blending water supplies
- Proximity to ultimate discharge location
 - Gila River



Siting Analysis

GIS Layers/Factors
Land Acquisition/Ownership
Public Accessibility
Site accessibility
Required pipeline length for Brine (6-inch)
Required pipeline length from treated Superfund (8-inch)
Required pipeline length from treated Effluent (8-inch)
Required pipeline length for Blend (12-inch)
Distance from COG reclaimed transmission main
Fiber Optic-Line Distance Needed
Energy requirements for Pumped Brine
Energy requirements for Pumped Superfund
Energy requirements for Pumped Effluent
Flood Zone Designations
Goodyear Airport Bird Strike Mitigation FAA requirements
Future Road Buffers - COG transportation planning
Power line transmission Rights-of-Way



Site Selection



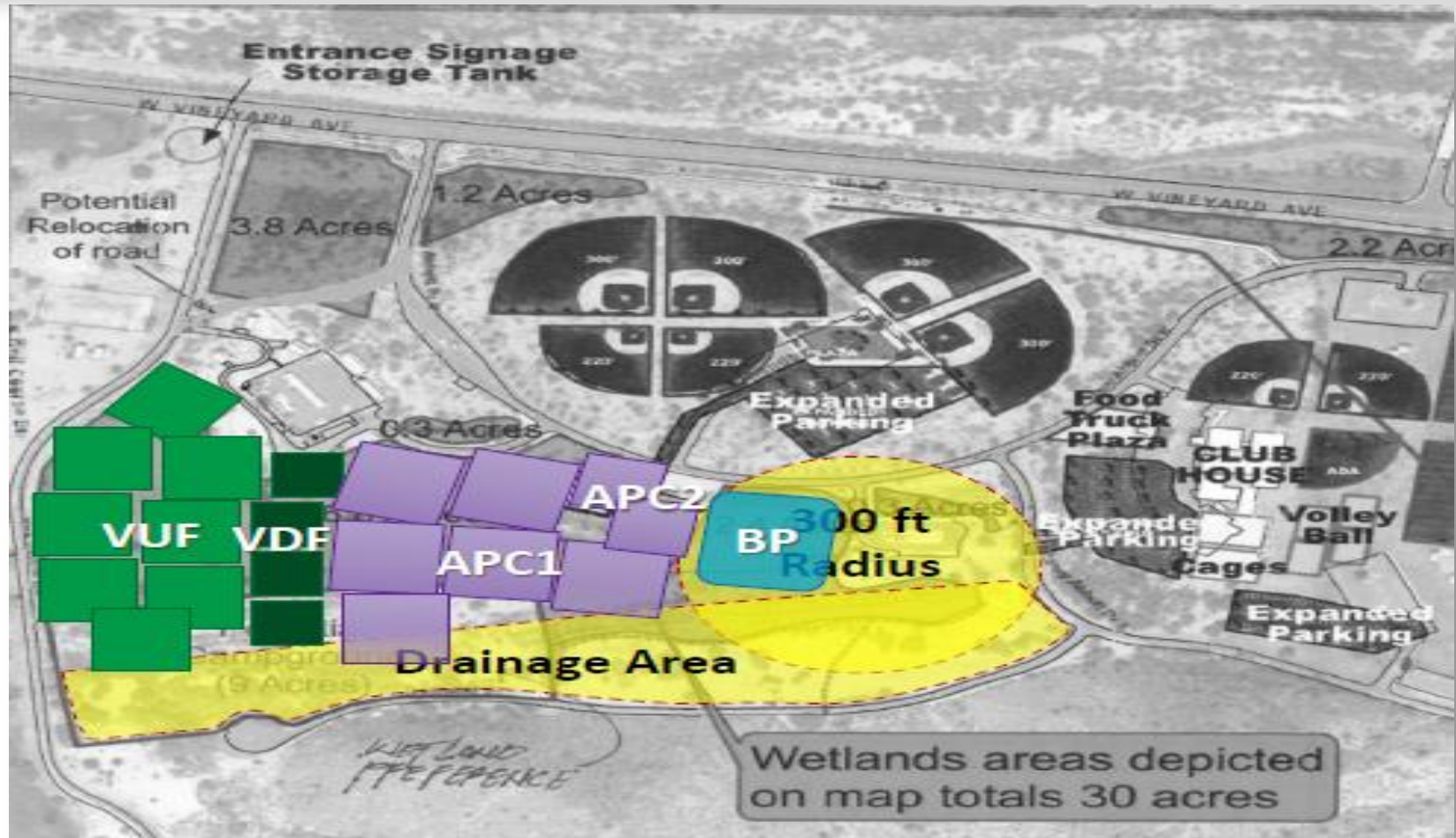
- GIS siting analysis identified the Estrella Mountain Regional Park and the Tres Rio Golf Course as the optimum site
- Maricopa County Parks & Recreation the owner of the Park and Golf Course
- Had already been included as a stakeholder
- In the process of creating a new Master Plan for the park and were excited to include concept of a wetland
- Maricopa County has become a partner in locating the future wetlands



WETLANDS, SPORTS FIELDS

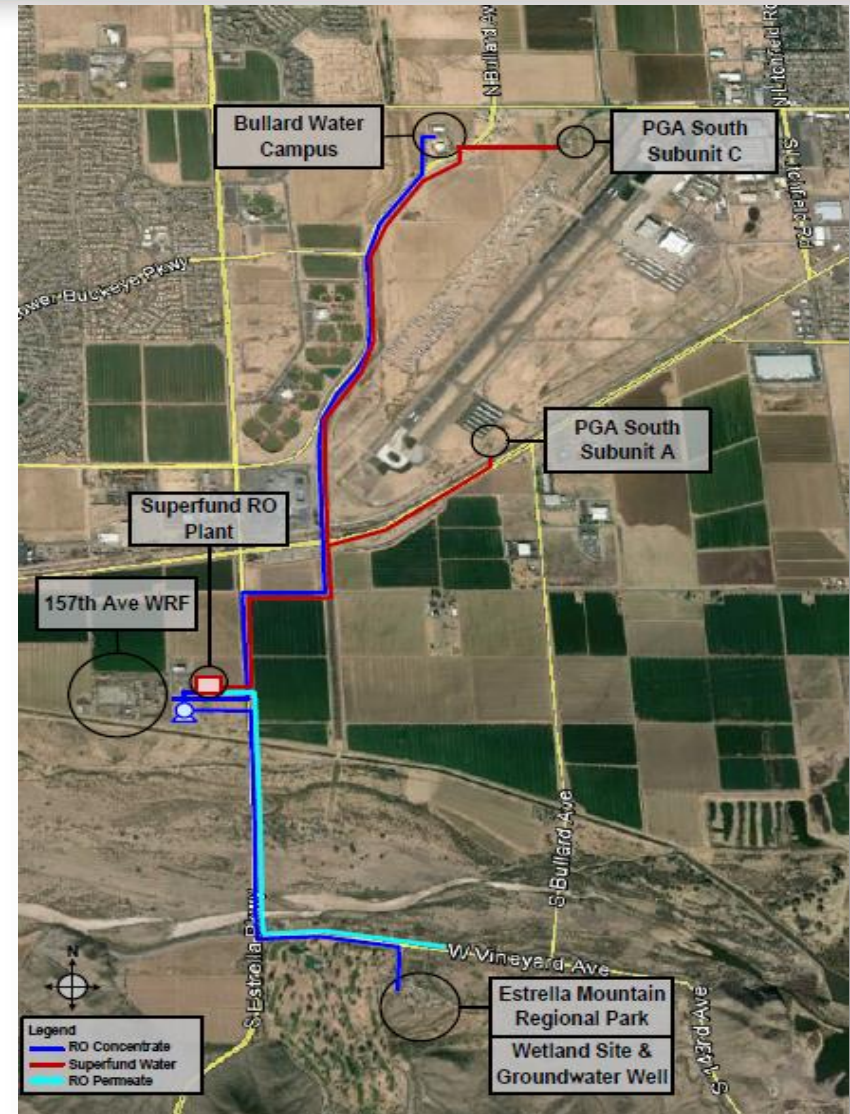


Estrella Mountain Regional Park



Water Blending Analysis

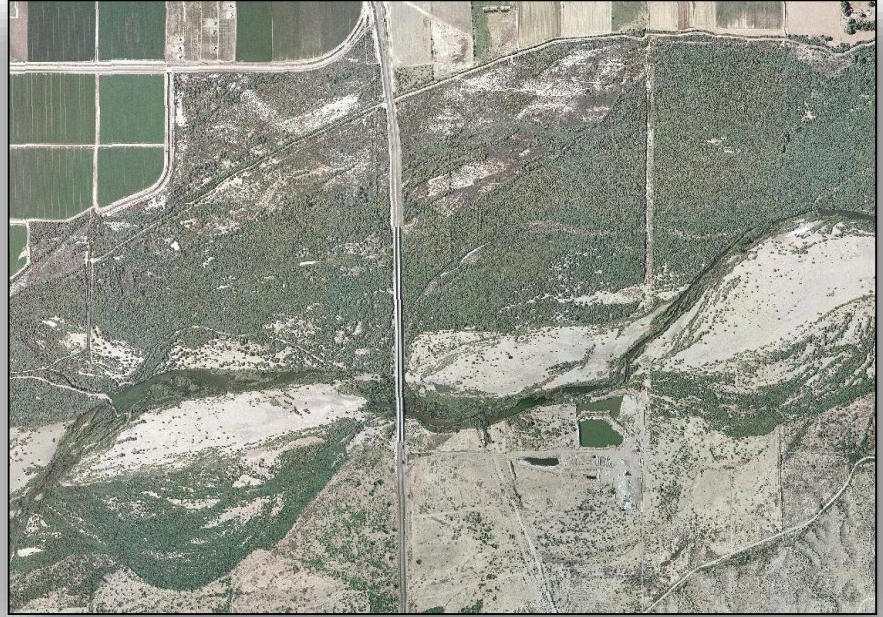
- High salinity wetland discharge will need to be blended with low salinity water to match water quality of discharge to the Gila River
- Superfund entities have expressed an eagerness for the increased pumping and treatment of water to expedite remediation
- They have become a partner in providing additional water supplies



Gila River Flooding Issues



1950



2002

Tamarisk (Salt Cedar) invasive propagation
overtaking natural riparian vegetation

Gila River Flooding Issues



- Tamarisk causes a lack of river channelization
- Backs up water flows
- Increases flood zones of the river

El Rio Watercourse Plan

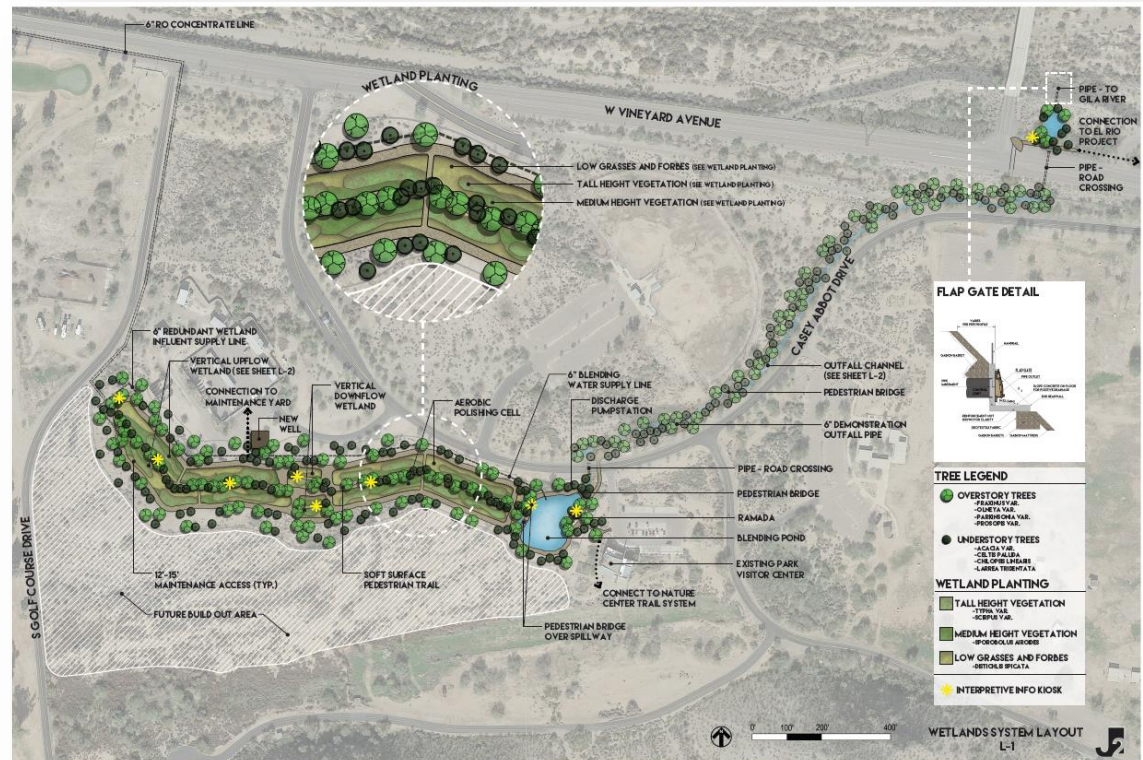
Flood Control District of Maricopa County developing a strategy:

1. Flood mitigation
 2. Tamarisk removal
 3. Riparian restoration
 4. Perennial water supplies for channelizing the river and maintaining riparian vegetation
- Needs a perennial river flow



One Water Solution

- Create a beautiful wetland that will treat the City R/O brine flows
- Create a recreational, educational, and environmental enhancement at an existing recreational facility

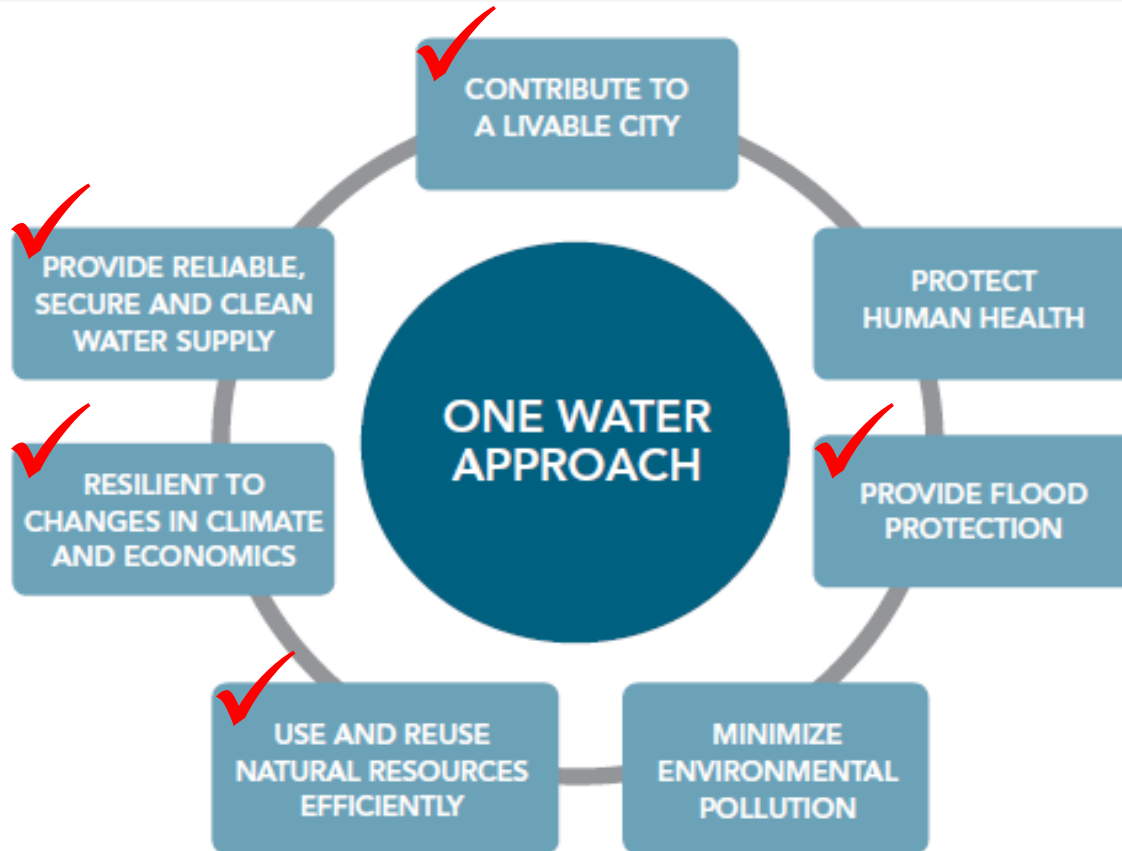


One Water Solution

1. Provide a perennial water supply as part of a river restoration plan
2. Maintain the restored river riparian area
3. Keep the river channelized
4. Mitigate flooding issues



One Water



Conclusions

From Brine to Beautiful

- Fully evaluated an inland brine disposal issue
- Included all potential stakeholders
- Developed new partnership opportunities
- Designed a beautiful wetland that will provide recreation, education, and environmental enhancements to an existing regional park
- Utilize remediated groundwater as a blending source for the wetland discharges into the Gila River
- Provide a perennial water source for the Gila River restoration, riparian health, and flood mitigation



Next Steps

- Permits
- Capital Improvement Plan – Phase One
Demonstration sized project



Award Winning Approach



2016 – “One Water Program of the Year”



2016 – “Top Project”



2016 – “Most Innovative Project of the Year”



Questions or Comments?

